

EXHIBIT S



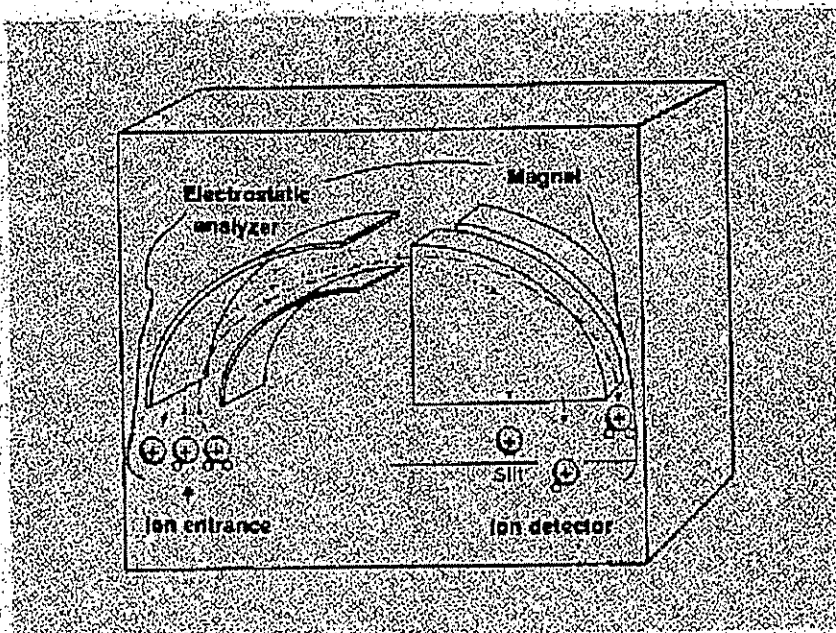
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HOW DOES THE ANALYZER WORK?

The analyzer uses dispersion or filtering to sort ions according to their mass-to-charge ratios or a related property. The most widely used analyzers are magnetic sectors, quadrupole mass filters, quadrupole ion traps, Fourier transform ion cyclotron resonance spectrometers, and time-of-flight mass analyzers.

Magnetic sectors bend the trajectories of ions into circular paths of radii that depend on the momentum-to-charge ratios of the ions. Ions of larger m/z follow larger radius paths than ions of smaller m/z values, so ions of differing m/z values are dispersed in space. By changing the ion trajectories through variation of the magnetic field strength, ions of different nominal mass-to-charge ratios can be focused on a detector.

Figure 4
Electrostatic and magnetic sectors in a double focusing arrangement. The slit is the directional and energy focus point.



Double focusing mass spectrometers use a combination of magnetic and electrical fields to focus and separate ions. A common configuration for a sector instrument is the geometry shown in Figure 4, in which a magnetic "sector" follows an electric "sector". The slit acts as a filter to select for a specific m/z value. The electric sector focuses the ions with respect to differences in kinetic energy that they may have as they exit the source region. "Double focusing," this combination of "angular" or "directional" focusing and energy focusing, provides mass resolution high enough to separate ions of the same nominal mass but different chemical formulae, such as C_2H_4 , N_2 and CO at m/z 28. The so-called "exact masses", more properly "high precision masses", of C_2H_4 , N_2 and CO are 28.0313, 28.0061, and 27.9949 Daltons, respectively².

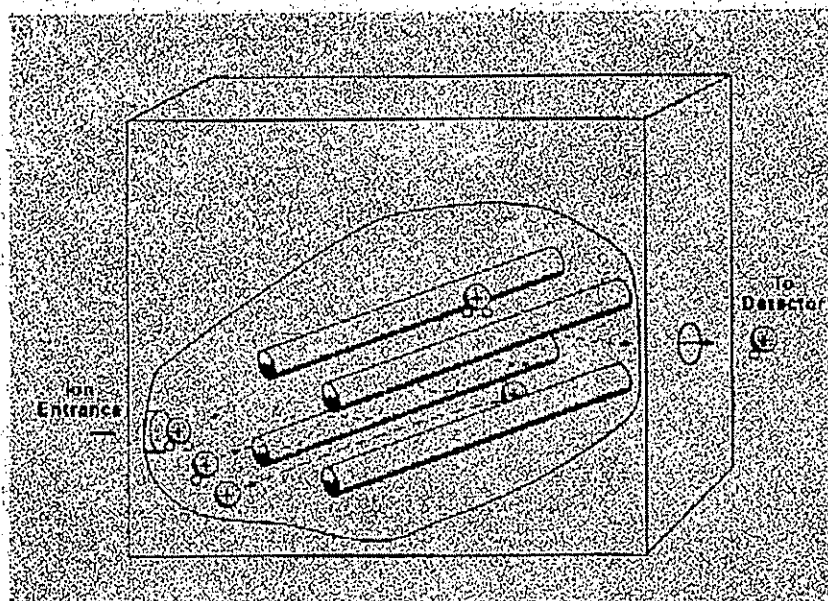


Figure 5

The quadrupole mass filter. Ions with the selected mass-to-charge ratio pass through the analyzer to be collected at the detector, while ions with other m/z values collide with or escape between the rods.

Another type of mass analyzer, called a quadrupole mass filter, consists of four parallel poles or rods. In this device (Figure 5), mass sorting depends on ion motion resulting from simultaneously applied constant (dc) and radio frequency electric (rf) electric fields. Scanning is accomplished by systematical changing the field strengths, thereby changing the m/z value that is transmitted through the analyzer. Quadrupole mass spectrometers provide lower resolution than double focusing instruments but tend to be more easily interfaced to various inlet systems and to be less costly.

The quadrupole ion trap mass spectrometer (Figure 6) operates on a principle similar to a quadrupole mass filter. However, it does not operate as a filter. Rather, the ion trap stores ions for subsequent experiments and analysis. It uses fields generated by rf (and sometimes dc) voltages applied to electrodes arranged in a sandwich geometry: a ring electrode in the middle with cap electrodes on each end. Within a selected range of mass-to-charge ratios determined by the applied voltages, the device traps ions in the space bounded by the electrodes. Typically, a mass spectrum is produced by scanning the applied rf voltages to eject ions sequentially of increasing mass-to-charge ratio through an end cap opening for detection.

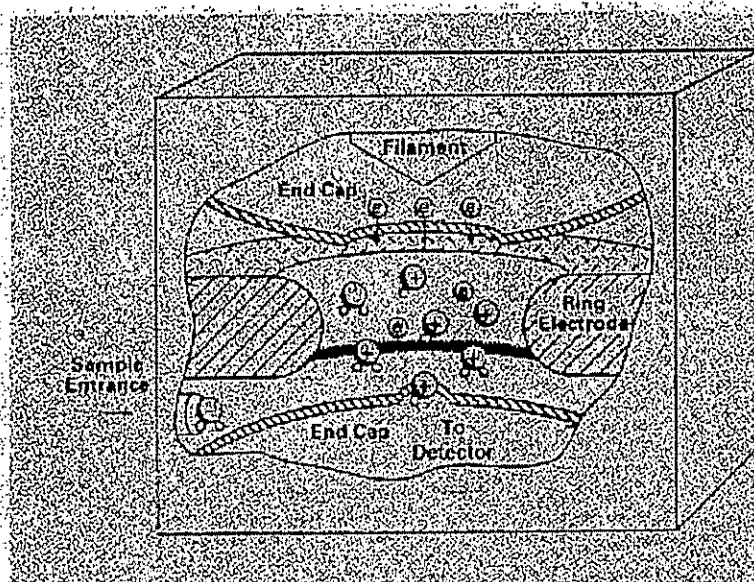
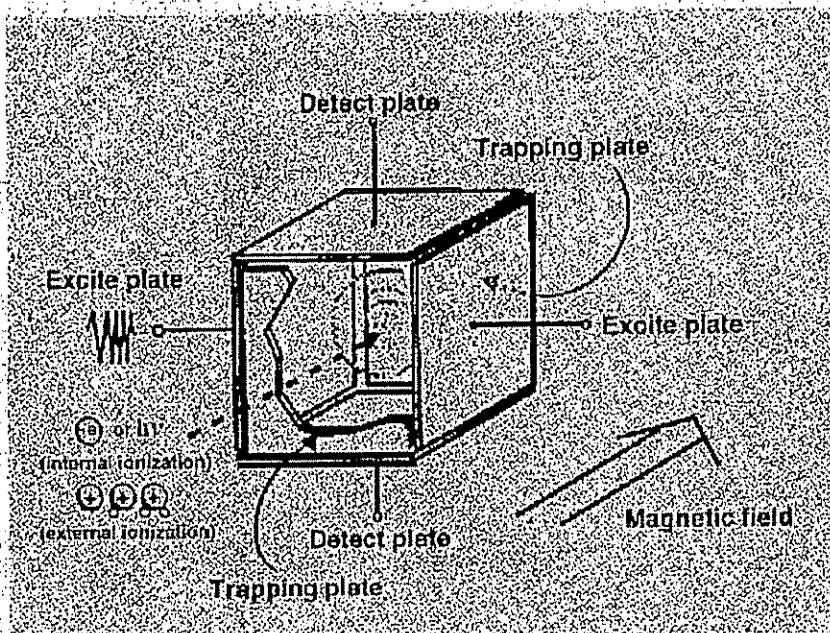


Figure 6
Quadrupole
ion trap mass
spectrometer.
 Ionization and
 mass sorting
 occur in the
 space bounded
 by the ring and
 cap electrodes.
 Alternatively,
 sample ions
 can be formed
 externally and
 then injected
 through an
 end cap opening.

Two other analyzers now being used frequently are the Fourier transform ion cyclotron resonance (FT-ICR) spectrometer and the time-of-flight (TOF) mass spectrometer. The unique capabilities of each of these mass analyzers make them especially useful as mass spectrometry moves into new areas of application.

In an FT-ICR spectrometer (Figure 7) ions are trapped electrostatically within a cubic cell in a constant magnetic field. A covalent orbital ("cyclotron") motion is induced by the application of a radio-frequency pulse between the excite plates. The orbiting ions generate a faint signal in the detect plates of the cell. The frequency of the signal from each ion is equal to its orbital frequency, which in turn is inversely related to its m/z value. The signal intensity of each frequency is proportional to the number of ions having that m/z value. The signal is amplified and all the frequency components are determined, yielding the mass spectrum. If the pressure in the cell is very low, the ion orbital motion can be maintained over many cycles and the frequency can be measured with very high precision. The FT-ICR instrument can therefore be used to generate very high resolution spectra.

Figure 7
FT-ICR
 spectrometer.
 Ions are trapped
 within a cubic
 cell under the
 influence of
 small trapping
 potentials and a
 constant
 magnetic field;
 the frequency of
 the signal
 measured at the
 detect plate
 is inversely
 proportional to
 ion m/z .



Time-of-flight mass analyzers (Figure 8) separate ions by virtue of their different flight times over a known distance. A brief burst of ions is emitted from a source. These ions are accelerated so that ions like charge have equal kinetic energy and then are directed into a flight tube. Since kinetic energy is equal to $1/2 mv^2$, where m is the mass of the ion and v is the ion velocity, the lower the ion's mass, the greater the velocity and shorter its flight time. The travel time from the ion source through the flight tube to the detector, measured in microseconds, can be transformed to the m/z value through the relationships described above. Because all ion masses are measured for each ion burst, TOF mass spectrometers offer high sensitivity as well as rapid scanning. They can provide mass data for very high mass biomolecules.

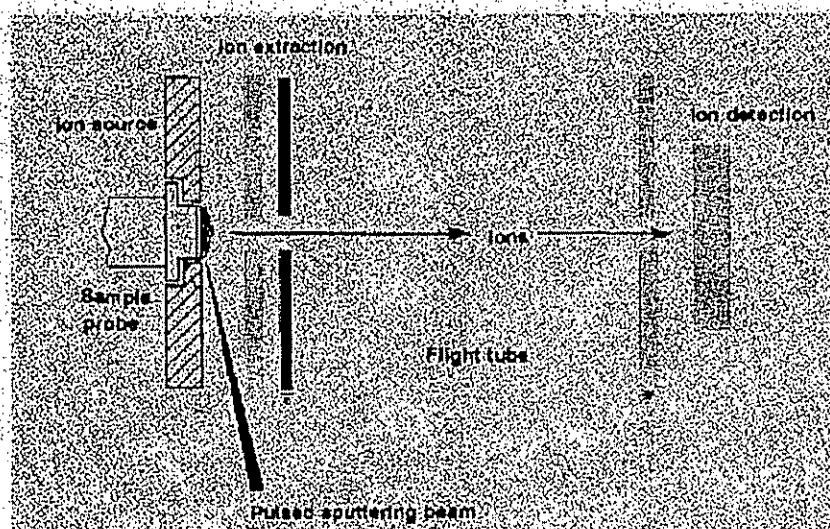


Figure 8
 In this time-of-
 flight mass
 spectrometer,
 ions formed
 from the sample
 by the pulsed
 beam arrive at
 the detector in
 the order of
 their m/z values.

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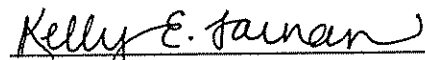
I hereby certify that on November 18, 2005, I electronically filed the foregoing document with the Clerk of Court using CM/ECF which will send notification of such filing, and hand delivered, to the following:

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